

## **SECTION 22**

### **DECK DRAINAGE**

#### **1.22.1 HYDRAULIC CRITERIA**

- a. In the design of drainage for bridge decks, the methods included in the NJDOT Roadway Design Manual shall be used.
- b. Bridge deck drainage requirements shall be determined on a project to project basis.
- c. Scupper spacing shall be in accordance with the NJDOT Roadway Design Manual.

#### **1.22.2 CROSS SLOPES**

The minimum cross slope on driving lanes and shoulders on bridge decks shall be in accordance with the Roadway Design Manual and shall match the approach roadway.

#### **1.22.3 GRADES**

- a. Bridge decks require adequate grade for proper drainage. This will ensure that chlorides drain off the bridge deck and will prevent ponding and freezing of water. In addition, proper drainage prevents hydroplaning on decks with little surface texture.
- b. Sag vertical curves should be avoided on bridge decks wherever possible for aesthetic reasons. However, when used, the requirements of the NJDOT Roadway Design Manual shall apply. In order to have adequate longitudinal drainage near the high point of vertical curves, the grade shall not be flatter than required for sight distance requirements and shall be in accordance with the NJDOT Roadway Design Manual. Vertical curves on bridge decks should provide a minimum grade of 0.5 percent. If the longitudinal grade is less than 0.5 percent, additional drains or special sloping of the gutters may be required.

#### **1.22.4 INLETS AND DOWNSPOUTS**

- a. Generally, the number of inlet bridge drains should be kept to a minimum. Bridge drains complicate the deck slab and/or parapet details and generally become a maintenance problem in future years.
  - 1.) Since complex drainage systems are more susceptible to blockage by debris, these systems should be avoided and the most simplistic alternative should be utilized.
  - 2.) Bridge drains are generally not recommended on structures less than 120 meters long if they have full width shoulders, adequate cross slopes

and have adequate catch basins on the bridge approaches, unless adverse geometric considerations dictate.

Structures which do not have full shoulders or have sidewalks (i.e., the design spread is much smaller than above) will require bridge deck drains at more frequent intervals as determined by design calculations. From a practical standpoint, deck drains should be placed near and up slope from expansion joints on the bridge deck to keep storm drainage out of the joints and away from bridge members.

- b. Bridge drainage systems over streams shall be located midway between diaphragms or crossframes and shall discharge directly into the stream such that no part of the superstructure or adjacent substructure can be affected. Drainage directly onto unpaved embankments or natural ground where erosion could undermine structural elements will not be permitted.
- c. Bridge drainage systems over land shall avoid horizontal runs of drain pipe if a reasonable modification to the design scupper spacing permits the placement of drains adjacent to piers at the low end of spans. Scuppers shall not be discharged on embankments or any traveled way (either vehicular or pedestrian). When applicable and feasible, drain pipe shall be hidden from the view of oncoming traffic.
- d. Long runs of outlet pipe on flat grades shall be avoided. Where horizontal runs of drain pipe cannot be avoided, the minimum pitch shall be 8 percent.
- e. Drainage from bridge superstructures or embankments shall not discharge on or across a railroad right-of-way without the approval of the railroad company.
- f. Downspouts, where required, shall be fabricated from galvanized steel alloy pipe or fiberglass pipe and shall have a minimum diameter of 200 millimeters. No painting of the galvanized steel alloy pipe is required. Pipe shall be provided with readily accessible cleanouts and shall be located such that no water is discharged against any portion of the structure. The pipe shall preferably discharge into a drainage system which conducts the water away from the structure. Refer to Section 517 of the NJDOT Standard Specifications for Road and Bridge Construction for more information concerning downspout pipe materials.
- g. Downspouts shall be located so as to facilitate their discharge away from traffic. Downspouts shall not be cast in the inside of or within any substructure limits.
- h. Bicycle grates shall be used for all inlets.

#### **1.22.5 CATCH BASIN SYSTEM AT BRIDGE ENDS**

- a. Unless cross-slopes or superelevation preclude flow on one side of the roadway, any bridge that is on a grade or in a sag, where it may collect highway drainage, should have catch basins provided just off the upgrade end of the bridge in each gutter.

Inlets placed up slope of the bridge must be designed and placed to intercept 100 percent of the approach flow using the return period selected for the roadway system. Most bridge drainage systems are marginal, and additional water from the approach roadways should not be imposed on them.

Water should be prevented from running down a crack at the paving notch and undermining an abutment or wingwall. A similar nuisance is created when water runs down a median strip, between parallel roadways and parallel bridges, and washes out the slope paving underneath.

- b. This guidance will apply to new bridge designs, bridge replacements, and reconstruction projects.